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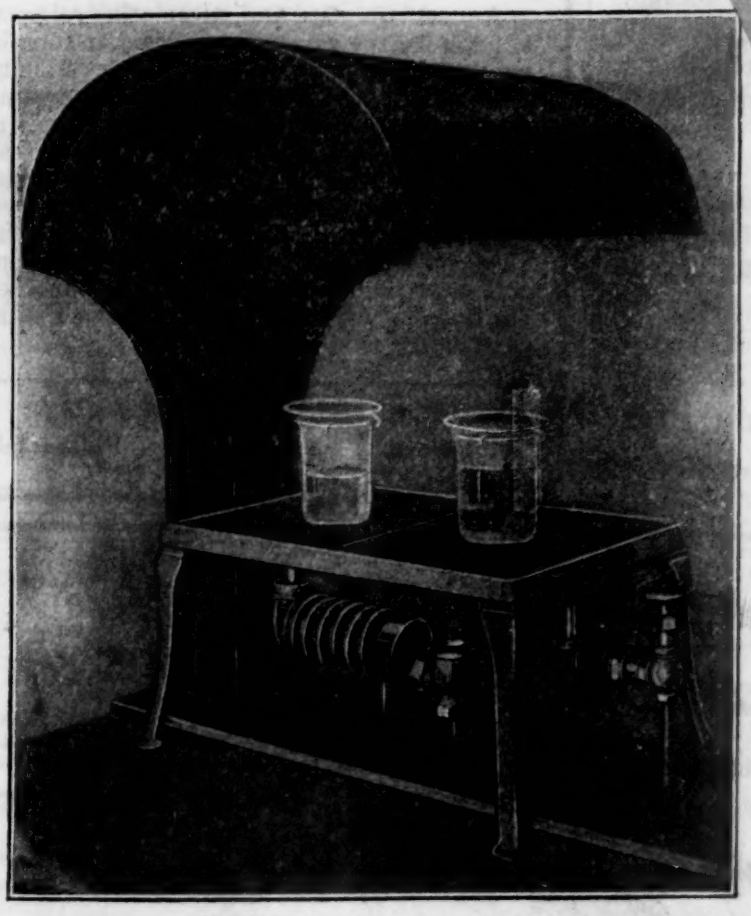

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RESEARCH IN EUGENICS[1]

MAN is studying all phenomena. He has at last come to study himself. Not his diseases, not his language, not his customs merely, but also his more intimate self. Man is studying man as an animal, who varies in his traits, who selects his mates for better or worse, who has a larger or smaller number of children that are more or less healthy and live for a varying period. The races of man are being studied not merely to list their differences, but to find how those differences arose and how they are transmitted to progeny and how they intermingle. We are studying the laws that govern the distribution of traits in the family; we are studying the consequences of combinations of these traits in the instincts, interests and behavior of individuals. At last we are studying man as the product of breeding and as the subject of an evolutionary process. And we are studying the human germ plasm, its composition, its mutations and its mixtures.

And why do we investigate? Is not enough known to warrant *propaganda;* and should we not better organize for a campaign to change what needs changing? Alas! we have now too little precise knowledge in any field of eugenics. We can command respect for our eugenic conclusions only as our findings are based on rigid proof, a proof that is either statistical or experimental. Only as we are able to base our statements on scientific, quantitative data can we hope to carry conviction and not arouse contrary opinion. People do not have heated discussions on the multiplication table; they will not dispute quantitative findings in any science.

It is largely due to the extraordinary vision of Mrs. E. H. Harriman, the founder of the Eugenics Record Office, that in this country eugenics is more a subject of research than of

[1] Address at the opening session of the International Congress of Eugenics.

propaganda. She maintained that we should be more concerned with knowing than with doing. Ascertained facts do not require propaganda.

It is sometimes asserted that research in eugenics belongs to the realm of applied science, and much of it does. But not all. There are fields of eugenical research, especially in human genetics, that are pure research in as much as they are devoted to investigations that can not be carried out so well on any other material. For example, inheritance of psychological traits, of temperament and of sense perception.

In so far as eugenics may lay claim to being a science, it has not only a subject matter—but also a method of its own. In studying the genetics of the lower animals, we proceed by the method of control of matings. Now this method is obviously not applicable to man in modern civilized countries. It has to be replaced by the collection of the history of matings that have been already made and a study of their progeny. We replace the experimental mating of the geneticist with the principle that every fertile human mating is an experiment in genetics, and it is for us to record the result of the experiment. Some day, we may hope, human matings will be carried beyond the stage of experiment.

At present, then, the student of human genetics must collect data on human matings and their outcome. Of course, he must know, as thoroughly as he can, the genetic nature of the matings; so that he can give the probable genetic composition of the gametes. This means that he must know for the mated pair, the parents, uncles and aunts and their children. He can then check his findings by studying the traits of the children. Since the capacity of one man for collecting by himself is very limited, it is necessary to train observers to collect data. Hence has arisen the profession of eugenical field worker whose function it is to study through three or more generations and as analytically as possible all the members of an inter-generating group so that their probable genetic composition may be known. By gathering together in one depository a large quantity of carefully ascertained family data, the basis is laid for human genetical studies.

The history of the development of the method of eugenical field workers is not a long one. Dr. Alexander Graham Bell was one of the first to use it extensively in this country. He employed such field workers in his study of deaf mutes especially those of Martha's Vineyard, in the early eighties. The Reverend Oscar McCulloch made use of field workers in his study of the Ishmaelites in the nineties, and at the Vineland Training School such workers were employed before 1910. A large number of eugenical field workers (about 200) have been trained by the Eugenics Record Office since its beginning in 1910.

Besides trained field workers, numerous volunteers are in a position to contribute data. Thus, in 1884, Francis Galton distributed his questionnaires called "Record of Family Faculties," and over 150 persons volunteered to fill them out and return them to him for study. The Eugenics Record Office has made use of a similar questionnaire called "Record of Family Traits," of which 4,000, of varying degrees of excellence, have been deposited in that office. Some of these "Records" are exceptionally valuable. It appears that many persons show the capacity for and interest in filling out such schedules excellently. A few others will take the pains to make a still more detailed analysis of the individuals of their families. Many of these records have to be considered as *finders* merely; as guides to further inquiries.

Additional records that are often of value are the printed genealogies and town histories, of which so many have been printed in this country, especially for the northeastern section. In addition, biographies, especially sets of biographies relating to members of a single family, will yield to the analyst of human traits data of the greatest importance. Finally all records—those of field workers, of volunteers and the printed records—must be indexed by name, place and trait so that their contents shall be readily available.

In inquiries into human genetics it is de-

sirable, where possible, to breed experimentally mammals, if any are available, which show the same trait that we are studying in humans. This is often possible, and such study will afford a control of results gained on man. Thus have been studied hare-lip in dogs, fecundity in sheep, instincts in dogs, polydactylism in fowls.

In other studies the method employed will be that of accumulation of statistics, their tabulation and analysis. Thus we investigate mate selection, the relative fecundity and relative mortality of the various stocks and the effect on the germ plasm of a country of the different immigrant races.

Some of the results of analytical study of these eugenical data are fairly well established. A few clearly simple Mendelian traits have been found. Such is eye color in which brown is dominant over its absence. It is possible that in some cases additional factors may be present, but the rule serves as a first approximation. Dominant, also, appears to be curliness of the hair as contrasted with recessive straight. And there are various diseases and defects that appear either as simple dominants or recessives, such as abnormalities in number and form of fingers and toes, which are mostly dominant over the normal condition; various defects of the eye such as cataract, certain types of congenital deafness, various abnormalities of skin, and hair and nails.

Other, and probably many other, traits are due to multiple factors—so often this is true as to suggest the hypothesis that in mammals, as contrasted with insects, traits are genetically relatively complex. Thus stature and build and proportions of parts and pigmentation of hair and skin are dependent on multiple factors. Indeed, there seems to be evidence that negro skin color is dependent upon two pairs of factors which merely reinforce each other.

Other traits are associated with sex in the remarkable fashion called sex-linked. That is, they are usually found only in the male sex and are inherited through the mother, though she, herself, is not affected. In such cases one usually finds male relatives of the mother who are affected. Such are color blindness, hemophilia and atrophy of the optic nerve. The facts of sex-linked heredity bring home, even to the layman, the lesson that heredity is a matter of the gametes; and that bodily appearance often gives no hint of the nature of the particular germ-cells carried and, in so far, of what the inheritance shall be. The parents of an albino may have pigmented hair and skin, but both carry gametes which lack the capacity of forming pigment.

Our knowledge of the inheritance of these physical traits is sufficiently precise to be applied practically in cases of doubtful parentage. If the child, the known mother and both of the putative fathers can be seen, and some inquiry be made as to family stock of the three adults a decision can generally be rendered with a high degree of certainty ranging from 75 to 99 per cent. For usually there will not be one critical trait merely but several traits whose combined evidence will be overwhelming. Already the Eugenics Record Office has been asked to answer certain questions about the inheritance of traits in a case of a claimant who maintained that he was the son of a wealthy man who died without known heirs. As lawyers get more used to the idea of utilizing the advances of knowledge for evidence, it is probable that eugenical knowledge will be more and more called upon.

Not only of the physical traits referred to above but also of those of behavior we are learning the hereditary basis. It appears probable, from extensive pedigrees that have been analyzed, that feeble-mindness of the middle and higher grades is inherited as a simple recessive, or approximately so. It follows that two parents who are feeble-minded shall have only feeble-minded children and this is what is empirically found. It has been urged against this finding that it is improbable that so complicated a thing as full mentality depends upon only one factor. On the other hand, a consideration of the effect of internal secretions, of thyroid, of hypophysis and others leads to the conclusion that a brain with well differentiated intellectual centers may fail of complete development because of the absence of proper developmental impulses of glandular origin.

Two persons whose brains are thus under developed may differ greatly in their mental capacities, because they have fundamental nervous differences, just as seedlings of different species, while all alike under-developed, differ in certain specific traits. Apparently one group of hereditary mental defectives is such because those who belong to it lack a single factor for an adequate developmental impulse.

Epilepsy, of the ordinary juvenile, dementing type, seems to be due, like feeble-mindedness, to a single developmental defect. Also, dementia præcox has been found by several investigators to be due to a similar cause.

But not only mental but also emotional states have a hereditary basis. The prevailing depressed mood appears to be due to a glandular condition that is determined by a certain developmental defect; and a prevailing excitability appears to be determined by a hereditary condition, which may be a tendency to excessive secretion of the suprarenal glands.

Moreover, the quality of our senses has a clear hereditary basis, as the still unpublished work of Dr. Hazel Stanton on musical families clearly shows. It appears from these studies that not only have great musicians an innate capacity for discriminating between closely similar qualities of pitch, intensity, time and for tonal memory but they belong to families with these innate capacities. Also, it has been shown that these capacities are not improvable by training; they depend upon our very constitution. Now we have evidence that persons who have these capacities enjoy exercising them. Those in whom the capacities are slightly developed get no pleasure from exercising them. We conclude that the reason why musical people are such is primarily because of their possession of inborn musical capacities. The musician is born, not made. From these principles certain deductions seem naturally to flow. A great color artist is one in whom the innate capacity for color discrimination is well developed and his family shows other examples of colorists. The sculptor has the hereditary capacity for form discrimination and that is why he finds his highest pleasure in the art. The author is one whose verbal machinery is especially perfect. The sailor is one who finds his greatest pleasure in the beauty of form of the vessel, or perhaps in broad horizons and distant lands; he is neither claustrophil, nor domestic. In general, our vocations, or at least our avocations, are determined by our sensory structure and this is hereditary.

The fact that not only our physical but also our mental and temperamental characteristics have a hereditary basis has certain important social bearings. It leads us to regard more charitably the limitations of our fellow men. The false doctrines of human equality at birth and of freedom of the will have determined a line of practise in the fields of education and criminology that, it seems to me, is not productive of the best results. In education we must know the child's native capacities before we can properly train. In dealing with delinquents we must know the hereditary, mental and emotional make-up before we can get an explanation of the bad conduct and before we can intelligently treat the delinquent. Organized society is too prone to "pass the buck" of its own shortcomings to the hypothetical "bad-will" of the offender against the mores. We should do better if we treated the misdemeanant as we treat a puppy whose actions displease us. Either train him carefully, if he is trainable; otherwise, put him in a position where the exercise of his instincts will not offend us.

The relation of the glands of internal secretion, commonly known as endocrine glands, to human development and human behavior is becoming daily more obvious. Stature, build, proportions; details of development of bone, teeth, nails, hair, skin; intelligence, emotional control, all these things can be shown to be influenced by endocrine secretions. Indeed, it seems naturally to follow that the hereditary differences between people are due to hereditary differences in the activity of these glands. Now these glands, as is well known, secrete substances called "hormones" which regulate our physical, mental and temperamental constitution. The special quality and quantity

of these hormones is determined by the idiosyncrasies of the enzymes of the germ cells. The hormones that determine our personality, constitute the bridge that connects this *personality* on the one hand, with the *specific enzymes* packed away in the chromosomes of the germ cells, on the other. You and I differ by virtue of the difference of atomic structure and atomic activity of the enzymes and hormones which make up that part of the stream of life-yeast which has got into and is activating our protoplasm and will activate that of the fertilized egg that results from us and our consorts. Thus each is what he is in his physique, in his thoughts and in his reactions largely by virtue of the peculiar properties of those extraordinary activating substances, which are specific for him and other members of his family and race or biotype. The future of human genetics lies largely in a study of these activities, and the origin of differences or mutations in them.

The study of human genetics leads into numerous fields of the physiology of human reproduction. Of these one of the most significant is that of twin-production. This topic has many aspects. As is well known twins are of two types. Two-egg twins come from two eggs simultaneously ovulated and one-egg twins arise by a division into two embryos of a single young embryo. The two children which thus arise from one egg are often so marvellously similar that they are called "identical twins." Now these identical twins give a measure of the relative importance of heredity and environment, as Francis Galton pointed out. It is, indeed, marvellous to see how such twins, even though living far apart, retain their initial resemblancy, experience at almost exactly the same time similar disease and emotional disturbances. Even the thoughts, as measured by the so-called "association" tests and the finger prints are marvellously similar. The dissimilarity of environment has had little effect on altering the rhythm of development, which is controlled by an internal mechanism. The two-egg twins are merely ordinary brothers and sisters who are born simultaneously and though the intrauterine environment and that of early years is as nearly identical as possible, yet they are as dissimilar as brothers and sisters are apt to be.

Though human heredity is the leading branch of eugenical research, yet it is only one. A fascinating branch of the subject is that of mate selection, including a study of those external and internal conditions that control in this phenomenon. While propinquity is often considered the all-sufficient basis of mate selection, yet statistical research reveals such facts as these; that there is a selection of mates of corresponding divergence from the mean in stature; that red-haired persons do not marry as frequently as expected on a random basis; that persons of opposite temperaments tend to marry with each other.

Research on fecundity, especially the differing fecundity of peoples having dissimilar social values in the population has not received the attention it deserves; still we know something of the fractions of sons and daughters of college men and women and have some facts available towards a study of fecundity of the socially inadequate. Always, however, it is not to be forgotten that it is the residuum of surviving children of a marriage that counts in the race and the children of the less socially adequate strains are permitted a larger selective death rate than are those of the more efficient strains. That is one reason why from the less developed strains, vigorous and effective progeny are occasionally arising; while some lines of the more effective and prosperous families end in weak and lethal descendants. Modern surgery has done much to keep alive weak and defective individuals, but little to improve racial qualities. Selection and its effects, including those of war, have been all too little studied.

But fecundity of stocks is only a part of the problem in a country which, like ours, has in a single year, added about as much to the population by immigration as by birth. Probably never before in the world has such a migration of all sorts of races in such numbers, over so great a distance, taken place. Here in America we have watched the process

with misgivings, and felt a lack of sufficient knowledge to direct our action. The present policy of *selecting* immigrants is a reasonable one, certainly; and every one who recognizes the effect of quality of the germ-plasm on national life, hopes it will be continued and extended until we know something of the family, as well as individual performance, of each applicant for entry into the United States. The best, as well as the most recent study of the effect of a mixture of races upon a country is Mr. Charles W. Gould's "America: A Family Matter," and his conclusions are not encouraging. But the student of human genetics hopes to put this marvellous mixture of races to account in his study of human inheritance. The greatest opportunity in the world is offered for the study, since nearly all the races of mankind can be found in New York City alone, in considerable numbers, talking the one language and making mixed marriages, which are often strikingly diverse. This is a field that is extremely alluring and which has been little worked.

But I fear I tire you with this prolonged discussion of the results and the future of eugenical research. No doubt there are many who are inquiring "But where does environment come in?" And there are others who would urge that the great problem for investigation is that of the relative importance of heredity and environment. It seems to me that we should not formulate the problem in this manner. There is no heredity without environment and few environmental effects which are not dependent also upon heredity. Schooling is good for those who are not feeble-minded; moral training yields excellent results in the case of such as have normal inhibitions; musical education is valuable if the elements of musical capacity are present; painting lessons are fine if the pupil be not color blind. Certainly every child deserves the greatest possible opportunities; but the same conditions will be an opportunity to him who is able to take advantage of them, and no opportunity to him whose hereditary limitations do not enable him to use them.

And finally, what are some of the practical applications that we may expect to be made of eugenical research? One, certainly, is a higher estimation of the importance of hereditary capacities in human behavior. This may save us from disregard of innate differences—capacities which lead us on the one hand to adjudge all men equally capable of acting in accordance with the *mores;* and, on the other, to explain all offences as due to poor environment. Both false views neglect the fact of differences in inborn capacities.

Again, there will come a realization of the importance of heredity in marriage matings. Young persons to whom marriage is so serious a matter, will be led to stop and consider, when they feel they are falling in love, and inquire concerning consequences to offspring. Already there is being developed a well-defined conscience in the matters of cousin marriages, and of matings into families with grossly defective members. This is shown by the extensive correspondence that the Eugenics Record Office has been obliged to enter into with persons who are contemplating marriage. They are quite willing to submit an extensive account of their family traits; and they write to learn what is known about the inheritance of some family weakness or defect. The people who make these inquiries are often unusually intelligent and not at all radical; some of them stand high in the social world. It is a high idealism and a forward looking one which leads them to seek the desired knowledge and one can only respond to these requests, telling what is known, or highly probable, in respect to the recurrence of the family defects in the offspring. Whether the conclusions that one is able to give are always very valuable or not, at least the custom of considering children and their inheritance of familial traits is one to be encouraged. Normal persons marry to beget normal children and it is natural for them to seek information concerning heredity of particular traits.

And again, it may be hoped that the study of racial characters will lead men to a broader vision of the human race and the fact that its fate is controllable. We may hope that reason-

able persons will consider the progress of mankind, not by the years of generations merely, but by centuries or millenia. We may learn by the history of mankind in the last 20,000 years how near it has come to extinction; and we must recognize that it will take only a little interference with natural instincts and a little interference with natural selection during a few generations to bring the species, or one race of it, rather abruptly to an end, just as other human races have come to an end in historical times. The human species must eventually go the way of all species of which we have a paleontological record; already there are clear signs of a wide-spread deterioration in this most complex and unstable of all animal types. A failure to be influenced by the findings of the students of eugenics or a continuance in our present fatuous belief in the potency of money to cure racial evils will hasten the end. But if there be a serious support of research in eugenics and a willingness to be guided by clearly established facts in this field, the end of our species may long be postponed and the race may be brought to higher levels of racial health, happiness and effectiveness.

CHARLES B. DAVENPORT

JOEL ASAPH ALLEN

THROUGH the death, on August 29, 1921, of Dr. Joel Asaph Allen, science has lost a pioneer and a most devoted servant. A memorable career, filled with achievement and marked by years of unflagging application and energy, has been closed in its eighty-fourth year.

Joel Asaph Allen was born in Springfield, Massachusetts, July 19, 1838, of New England parentage. Through his father, Joel Allen, he traced his descent back to an Allen who came to the Colonies about 1630, while the maternal line of descent was from John Trumbull who settled in Massachusetts in 1639. The eldest of five children, his early life was spent on the paternal farm in an atmosphere of puritanical strictness. His schooling began with attendance at the rural school, generally in the winter only, because of the demands of the farm for the summer months. The boy very early displayed an intense love of nature and a keen interest in all its manifestations. While this did not meet with the wishes of his father there was no active or unkind opposition, and from his mother he met only sympathy.

Dependent at first solely upon his own efforts, without the aid of books or the acquaintance of naturalists, the boy showed a great determination to interpret the life about him. Later, when his attendance at Wilbraham Academy led up to Cambridge and the opportunity of studying under Louis Agassiz, he was prepared to make the most of every opportunity. However, this zeal for the constant study of nature, in addition to the work necessary in helping on the farm, resulted in the overtaxing of his strength and the impairment of his health, a condition which gave him much trouble throughout his lifetime and finally put an end to all field work.

His association with Agassiz began when he entered Cambridge as a special student and lasted until the latter's death. Among his associates in these classes conducted by the great teacher, were men destined to become famous, authorities in their special fields. The names of Alpheus Hyatt, E. S. Morse, A. S. Packard and A. E. Verrill are to be found on the rosters of those days at Cambridge.

The story of his schooling at Wilbraham Academy and later at Cambridge is that of a young man anxious for knowledge, but especially eager for the subjects bearing upon the natural sciences. With an ardent desire to do editorial work, young Allen found difficulty in composition and set himself to acquire this facility by keeping a daily journal, among other items making note of current weather conditions. When a summary of these weather reports were handed in as a composition at the academy, the boy was delighted to discover that Professor Marcy, his instructor, thought them worth publication. The summary came out in the *New England Farmer* and was the first of a long series from

the young naturalist, then about eighteen or nineteen years of age. Thus was begun the literary career that has produced such bountiful results and the youth who forced himself to acquire facility in a daily journal developed into the editor of not one, but several, of the foremost publications of natural science.

At the Lawrence Scientific School, at Cambridge, Allen was the pupil of men whose names stood high—Louis Agassiz, Asa Gray, Lovering and Wyman. At this school his curriculum was heavily inclined toward the natural sciences and he learned the value of accurate and painstaking observation. Because of poor health and weak eyes, the student was compelled to take instruction irregularly and to suffer many obstacles in his struggle for education.

In 1865, Agassiz invited Allen to accompany him on a collecting trip to Brazil. The party numbered sixteen and all during the voyage south Professor Agassiz gave a series of lectures to the members of his party. They landed at Rio de Janeiro and different trips were planned. Allen was assigned to a party which was to visit the northern provinces. They set out on June 9, and after delays and difficulties with their native assistants reached Lagoa Santa on July 13. This is the locality made famous by the researches of Lund and the scientists explored the caves of the region for several days. The route necessitated long hard travel, partly by river, partly by pack train. Allen's health had broken down by the end of the third month of this trying life, and he was forced to leave the others and strike out for Bahia, which he reached by the end of November, after an overland journey of nearly 600 miles. His voyage northward was not soon to be forgotten, because his ship which ran into gales off Cape Hatteras, was driven off her course and only narrowly escaped foundering. Approaching the Cape a second time, she was again met with storms and eventually reached Boston ninety days out from Bahia.

In the attempt to build up his constitution, Allen severed connections with the Museum of Comparative Zoology and returned to the farm, but, with the partial return of strength, found the call of nature to be irresistible and made a collecting trip into the Middle West, 1867. This trip was successful in every way and when a summer had been spent out of doors and Allen felt equal to museum work once more, he wrote to Agassiz, who welcomed him back. The next eighteen years were spent at Cambridge, where he was in charge of the department of mammals and birds.

The winter of 1868–1869 was spent in East Florida where valuable material and experience was gained. Nine months were spent on a collecting trip to the Great Plains and the Rocky Mountains, in 1871–1872. Work was begun at Leavenworth. At this time there was trouble with the Indians and the small party had to exercise caution in their movements. Near Fort Hays they went on a buffalo hunt, and Allen had his first extensive experience with the mammal which was to be one of his favorites and the subject of a large monograph. Their itinerary took them through Denver and South Park, Cheyenne, Green River and Fort Fred Steele. The results of the expedition were most satisfactory and a large number of specimens were secured.

The next year, 1873, Allen made his last important field trip. He accompanied a party of railroad surveyors who were to locate the Northern Pacific Railroad westward from Bismark. It was during a period of Indian troubles, and a large military escort under General Custer went with the party. This was a historic trip, marked by skirmishes with the Indians, and by many other novel experiences. While opportunities for collecting specimens were not of the best, much of the territory traversed was zoologically unknown and much valuable information was brought back.

From 1876 to 1882, Dr. Allen served as a special collaborator of the United States Geological Survey, devoting most of his time to original research, publishing among other papers, "The American Bisons, Living and Extinct," and monographs of various families

of the North American Rodentia, the latter in cooperation with Dr. Elliot Coues. At this time his interest was drawn to marine mammals and after he published a "History of North American Pinnipeds" he took up the Cetaceans, but illness checked the work before it was finished and the results never were printed. A short trip to Colorado was taken, upon the advice of a physician, in the attempt to throw off this illness, but a nervous breakdown resulted and it was months before active work could be resumed.

In 1885, the financial resources of the Museum of Comparative Zoology were so restricted as to cut down opportunities for the staff, and Dr. Allen accepted a curatorship in the American Museum of Natural History in New York City. He took over his duties on May 1, 1885, and served thirty-six years in that capacity, as curator of the department of ornithology and mammalogy. Later this department was divided into the department of mammalogy and the department of ornithology, Dr. Allen retaining the curatorship of the former department. In 1921, he was made honorary curator in order to give him entire freedom for research work.

At the time he took over the department, the collections were very small with no research facilities, and no study collection to serve as the basis for original work. During his tenure, the department entered upon a period of growth and expansion of marvelous proportions. At first he was alone, without any assistants, but in 1888, he was given his first assistant, Mr. Frank M. Chapman, and later others joined the department until at the time of his death, the scientific staff of the two departments which were formerly his department, numbered ten, besides non-staff assistants and field collectors. Collections were brought in, first from the United States, Mexico and British Columbia; and then the scope of activities was enlarged to take in South America, Africa and the Orient. In 1921, his department had parties in the field and plans for work in Asia, Africa, Australia, North America, South America and the West Indies.

Coincident with the vast accumulation of research collections, which grew from practically nil, in 1885 when the new curator took charge, to a total of about 50,000 specimens of mammals in 1921, there has been a corresponding increase in the number of mammal groups placed upon exhibition in his department. There has been a transition from the hall filled with a heterogeneous assemblage of mounted individuals to halls given over to carefully planned habitat groups which tell a story. Publications from the department of mammals may be said to begin with Dr. Allen's curatorship and the total number of scientific papers written by him in this capacity is a surprisingly large number.

While Dr. Allen devoted his later years almost exclusively to research in mammalogy, the sum total of his endeavors discloses work in many other branches of natural science. The bibliography, published in the volume also containing the autobiography[1], contains the following large numbers of titles: papers on mammals, 271; on birds, 966; on reptiles, 5; on zoogeography, 9; on evolution, 22; on nomenclature, 35; on biography, 134; miscellaneous, 20; a grand total of 1,433 titles published up to 1916. Since 1916 many other papers have appeared and a great deal of manuscript has been prepared which has not been published. When it is considered that each one of these publications is a well thought out piece of work, in most cases necessitating days spent in the study of material, and that many of them are papers of length, such as his monographs on the bison, the seals or the musk ox, which contain several hundred pages of text, then one is forced to marvel at the amount of mental labor involved and the tireless energy that drove the man.

His youthful yearnings for editorial work were realized to the full. Beginning with the year 1874, when he edited a volume of the *Proceedings* of the Boston Society of Natural

[1] "Autobiographical Notes and a Bibliography of the Scientific Publications of Joel Asaph Allen." American Museum of Natural History in 1916.

History, he served continuously as the editor of one or more scientific publications until 1918, when he was forced to give up editorial work because his advancing age demanded that he restrict his activities. For forty-four years he acted in editorial capacities and some of these publications ranked with the foremost in natural science. From 1884–1911, he was editor of the *Auk, A Quarterly Journal of Ornithology,* the publication of the American Ornithologists Union, during which time twenty-eight volumes appeared. As a testimonial to the esteem in which his tenure was held by his fellow ornithologists, Witmer Stone, the succeeding editor of *The Auk,* wrote:

> Beginning with the initial volume of the Bulletin of the Nuttall Ornithological Club, and continuing to the present year, Dr. Allen has, without intermission, guided the course of this journal and its successor The Auk; and the series of thirty-six volumes stands as a perpetual monument to his ability, and his painstaking devotion to the cause of ornithology and the interests of the American Ornithologists' Union. There have been few continuous editorships of equal length in the history of scientific periodicals.

An even longer editorial service was rendered to the *Bulletin* of the American Museum of Natural History, for beginning with the first volume, 1886, he directed the ever lengthening series until 1918, a total of thirty-two years. From the standpoint merely of routine accomplishment, this would stand as an editorial achievement to be envied, but with Dr. Allen, editorial duty meant more than that and each contribution was read as painstakingly and given the same attention as he gave to his own personal contributions.

Nor was he content to rest his editorial laurels upon these two terms of service but edited the zoological numbers of the *Memoirs* of the American Museum of Natural History from 1893 to 1918, and was the editor, or a joint editor, of the two editions of the "Check-List of North American Birds," 1895 and 1910, "Supplement to the Code of Nomenclature and Check-List of North American Birds," 1889, and "The Code of Nomenclature" adopted in the American Ornithologists Union, 1908.

Among his first papers are many of a philosophical nature, such as articles on the geographical variation in mammals and birds, the geographical distribution of mammals and the laws that govern the distribution of animal life, the genesis of species, the instinct of migration, etc. It is quite likely that his inclination in this direction would have led to many other papers along similar lines, but when material from the field began to come into his department at the American Museum, it became necessary for him to devote his entire time to the building up of the department and the identification of species.

His philosophical papers show the result of close observation and keen analysis and some of his deductions are recognized today as natural laws. In 1876, in his "Geographical Variation among North American Mammals" he set forth the following:

> In a general way, the correlation of size with geographical distribution may be formulated in the following propositions:
>
> 1. *The maximum physical development of the individual is attained where the conditions of environment are most favorable to the life of the species.* Species being primarily limited in their distribution by climatic conditions, their representatives living at or near either of their respective latitudinal boundaries are more or less unfavorably affected by the influences that finally limit the range of the species. . . .
>
> 2. *The largest species of a group (genus, subfamily, or family, as the case may be) are found where the group to which they severally belong reaches its highest development, or where it has what may be termed its center of distribution.* In other words, species of a given group attain their maximum size where the conditions of existence for the group in question are the most favorable, just as the largest representatives of a species are found where the conditions are most favorable for the existence of the species.
>
> 3. *The most "typical" or most generalized representatives of a group are found also near its center of distribution, outlying forms being generally more or less "aberrant" or specialized.* Thus the Cervide, though nearly cosmopolitan in their distribution, attain their greatest development, both

as respects the size, and the number of species, in the temperate portions of the northern hemisphere. The tropical species of this group are the smallest of its representatives. Those of the temperate and cold temperate regions are the largest, where, too, the species are the most numerous. . . . The possession of large, branching, deciduous antlers forms one of the marked features of the family. These appendages attain their greatest development in the northern species, the tropical forms having been reduced almost to mere spikes, which in some species never pass beyond a rudimentary state. . . .

A paper published in 1871 "On the Mammals and Winter Birds of East Florida, with an Examination of certain assumed Specific Characters in Birds" brought forth the following comment from Coues:

> The article gained the Humboldt Scholarship, and is one of the most important of American ornithological works.

His work in taxonomy covered almost the entire mammal fauna of the world, from marsupials to monkeys, from shrews to whales, while his field of research has been at times in every one of the continental areas. The greater number of his papers are systematic taxonomic reports and the descriptions of new forms. He is the author of nearly seven hundred new mammal names, and fifty-three bird names.

Some of the most important of the accomplishments of Dr. Allen have been his labors in the field of scientific nomenclature, a field where authoritative workers are scarce because of the exacting demands of the problems. His knowledge of scientific literature was so deep, his memory for authors and dates so unusual, that he took particular delight in the solution of the weightest nomenclatural problems. His opinions command respect from scientists the world over and this fact has long been recognized in the positions held by the doctor on committees on nomenclature of both national and international organizations. It is in this field that the loss of his contributions will be most keenly felt.

He was a member of the Commission on Nomenclature of the International Congress of Zoology since 1910 and attended the meeting in Monaco in 1913.

A man of extreme modesty and retiring temperament, indeed bashful, he strove for no titles, sought for no publicity. Honors, however, came to him unasked. In 1886 he was granted the degree of Ph.D. by Indiana University; in 1903, he was awarded the Walker Grand Prize, Boston Society of Natural History, and in 1916 the Medal of the Linnæan Society of New York. He was a fellow or member of no less than thirty-three scientific societies in the United States and abroad.

He held high positions in many scientific organizations, the more important being that of president of the American Ornithologists Union, 1883–1891; an incorporator of the (first) Audubon Society for the Protection of Birds, 1886; a Founder and Director of the Audubon Society of the State of New York, 1897–1912; Vice-president of the New York Academy of Sciences, 1891–1894; President of the Linnæan Society of New York, 1890–1897; etc.

Dr. Allen possessed to a rare degree the faculty of concentration and devotion to his work. Not content with the amount of work done at his office in the museum, he carried books and material home with him, and his ideal vacation was one where he might take some special subject away with him where he could study unmolested. In brief, he lived for his work and to the psychology of this devotion may possibly, in part, be attributed his ripe age, attained in spite of long periods of ill health.

No one associated with Dr. Allen could fail to be impressed, not only with the very evident scholarly attainments of the man, but with his sincerity and simplicity. From a profound respect for his work, one passed readily to a love for the man, and an association with him in any work could be counted, not only as a most valuable mental training, to be prized in later years, but as a friendly contact no less to be remembered.

Dr. Allen married, in 1874, Mary Manning Cleveland and a son, Cleveland Allen was born to them. His wife died in 1879 and for seven years the doctor remained single. In 1886 he

married Susan Augusta Taft, who with his son Cleveland survives him. Dr. Allen's home life was idyllic and to this inspiration he was wont to attribute the achievements of his later life and the activity of his older years.

With the passing of Dr. Joel Asaph Allen the world has lost an earnest and sincere student, natural science has lost the power of an able pen backed by the searching analysis of level judgment, while his personal friends will mourn the loss of all this and more, for they have known him as a man.

H. E. Anthony
American Museum of Natural History

SCIENTIFIC EVENTS

THE DANISH DEEP-SEA EXPEDITION

We find in *Nature* an account of the Danish Deep-Sea Expedition, which left Copenhagen on August 30 on board the new research steamer *Dana*. It plans to spend about ten months in the temperate and tropical parts of the North Atlantic. The object of the expedition is to carry out deep-sea investigations in accordance with a scheme which was submitted by the leader of the expedition, Dr. Johs. Schmidt, to the International Council for the Exploration of the Sea during their meeting at Copenhagen in July last.

The *Dana*, of the Lord Mersey trawler type, was bought in England by the Danish Government to replace the old research steamer *Thor*, which was sold some years ago. The *Dana* has been equipped for marine research work at the Royal Dockyard, Copenhagen. She has a length of about 140 ft. between perpendiculars, and is 325 tons gross register. She carries a 600-h.p. triple expansion engine, giving her a speed of 9 knots. A large deckhouse has been constructed, which contains two laboratories—a larger biological laboratory with accommodation for five workers, and a smaller one for hydrographical work with room for two—together with a messroom for the scientific staff, and a cabin for the leader of the expedition. Below deck are the cabins of the scientific staff, and storerooms for the various instruments, fishing gears, collections, etc. The winches are worked by steam. A big trawl-winch placed forward has two drums, the smaller carrying 4000 meters of steel wire 14 mm. in diameter for trawling at moderate depths, and the larger, carrying 10,000 meters of steel wire tapering from 14 mm. to 7 mm. in diameter, to be used for greater depths. The three winches for vertical hauls (water-bottles, plankton nets, and sounding) are placed on the port side of the ship; one works the Lucas sounding machine and a drum carrying 6,000 meters of phosophor-bronze wire; another is a small hand-winch to be used for the surface layers; and the third works a big drum carrying 10,000 meters of steel wire 4 mm. in diameter. The steel-wire ropes have been supplied by Messrs. Craven and Speeding Bros., Sunderland, and the hydrographical instruments by the Laboratoire Hydrographique, Copenhagen, of which Professor Martin Knudsen is director.

The *personnel* of the expedition is as follows:—Dr. Johs. Schmidt, leader of the expedition; Dr. J. N. Nielsen (Meteorological Institute, Copenhagen), hydrographer; P. Jespersen and A. V. Taaning (Danish Committee for the Study of the Sea); K. Stephensen (Zoological Museum, Copenhagen); J. Olsen (Polytechnic College, Copenhagen), assistant hydrographer. N. C. Anderson, ship's doctor, will also take part in the investigations. Professor C. H. Ostenfeld expects to join the expedition later on during its stay in West Indian waters.

THE FIFTH AVENUE HOSPITAL OF NEW YORK

The Fifth Avenue Hospital Association is making an urgent plea for contributions to complete the construction of the new building at 105th Street and Fifth Avenue. The institution will combine the present Hahnemann Hospital and the Laura Franklin Free Hospital for Children. Dr. Wiley E. Woodbury, director of the hospital, has made a statement for the New York *Evening Post* in which he says:

> There is an enormous waste in the administration of the free ward, which is not realized by any

except those who have had direct experience with it. This waste will be eliminated to a large extent by housing patients in separate single rooms. And the keynote of the whole thing will be the flexibility of the service.

In the first place, it is the business of a hospital to cure people. No one will say that noise, confusion and unsightliness are conducive to cure. A separate room for each patient together with other provisions for privacy and comfort in this new hospital will eliminate noise, confusion, and unsightliness—and with them, fear. What that will save in energy and worry to doctor and nurse and patient is incalculable.

Next, the single-room system will save the nurse's time. In the ordinary ward all the supplies are kept at the end of the ward, and the nurse has to travel its entire length to get what she requires every time she goes to any one of the beds. We shall have each patient's equipment at the patient's bedside and save the nurse's time and strength.

Every bed will be working 100 per cent. We shall not be troubled by the necessity for sex segregation or disease classification.

With the ward system there is often a waiting list for the women's surgical ward, while several beds are empty in the men's ward. This means that two things happen: People who urgently need surgical treatment are denied it and empty beds add their quota to the overhead without working for it.

Again, in the classification of diseases, the maternity ward of the old type hospital may be half empty and the surgical and medical wards full. Yet it is impossible to put surgical and medical cases into a maternity ward, for fear of infection. That means more beds wasted, also heat and light and service. It is equally wrong to put children with adults. But in a wardless hospital in case of an epidemic among children the children can easily be put into adults' rooms.

Pneumonia and typhoid patients should never be put in open wards at all, because it is impossible to control the source of infection. These cases need varying temperatures; some, moreover, are of a virulent form and some are not; and some may be fairly safe at the start and develop into virulent cases later and infect others.

I have often seen a fifteen-bed ward occupied by only two patients. Of course, in cases like this it would be cheaper to put the patients into single rooms and close the wards; but frequently there is no single room vacant, and all the heat and service and light and equipment needed for fifteen people have to be expended upon two.

On the other hand, when a single room is unoccupied the lights are put out, the heat is turned off, the door is locked—and that room costs nothing for upkeep until it is occupied again.

Occupants of wards are invariably distressed by the rigid rules concerning visiting hours. These rules are necessary. People who are critically ill and those who are convalescent are all together in the same ward. Their requirements, of course, are different—those who are recovering need to be amused, to see their friends; and this is sure to disturb the critically ill even during a very limited visiting period. When all are in separate rooms, visiting hours will be limited only by the physician in charge.

The advantages in respect to ventilation and other conditions which should vary with varying types of illness are obvious. A pneumonia patient and one recovering from an operation need totally different conditions, and only by separating them can the greatest comfort be secured for each.

THE EMPLOYMENT OF MENTAL DEFECTIVES IN ENGLAND

ACCORDING to the *British Medical Journal*, the special schools after-care committee of the City of Birmingham Education Committee has the duty of keeping a record of the subsequent history of former pupils in the special schools for the mentally defective. The total number of cases included in its records has increased from 2,282 in the year 1919 to 2,504 during the past year, males numbering 1,503 and females 1,001. These figures indicate very clearly the ratio of three boys to two girls, which is frequently found in the various special schools for the mentally defective. Of the 2,504 cases in last year's records, 969 are doing remunerative work, 913 of these earning wages which average 30s. 10d. per week, while 56 are soldiers. The general depression in industrial and trade conditions has naturally had an effect upon the mentally defective cases in employment, and, while the number of men and youths under review this year has increased from 1,380 to 1,503, the number in employment has only risen from 630 to 655; the number of women and

girls in employment has actually decreased from 320 to 314, although the total number of cases reported on has grown from 902 to 1,001. During the war, and for some time afterwards, no difficulty was experienced in procuring situations for such mentally defective persons as were capable of employment, but under the present conditions of industry considerable difficulty arises. The earnings of those, however, who have remained in employment show the general upward tendency which wages had during 1920, and three men are each reported as able to earn £5 per week, while two others in business on their own account are reported to be making comfortable livings. The percentage of cases in institutions again decreased last year, and the committee says it finds that institutional accommodation for the mentally defective continues to be deplorably inadequate throughout the country as a whole.

BUREAU OF SPECIAL EDUCATION IN OHIO

The eighty-third General Assembly of Ohio appropriated $10,000 "for the training of teachers for subnormal and delinquent children." One sentence in an appropriation bill provided that this sum should be transferred to one of the state colleges of education "to be designated by a committee composed of the director of juvenile research, the president of Ohio University, the president of Miami University, the superintendent of Bowling Green State Normal School, and the superintendent of Kent State Normal School for such purposes." On December 30, 1920, the committee decided to place the work under the administration of Miami University. Practically all the initial appropriation was used for the purchase of psychological, anthropometric and medical apparatus, intelligence and educational test blanks, office and classroom furniture and equipment, material for special class work, a piano, a victrola, a portable projector, a Burroughs adding machine, etc., and the payment of salaries up to the end of the fiscal year, July 1, 1921.

Instruction was first offered in the summer session under the temporary direction of Dr. J. E. Wallace Wallin, who has been director of the psycho-educational clinic and special schools in St. Louis during the past seven years, and who during the preceding four years was director of laboratories of clinical psychology and anthropometry in the State Village for Epileptics in New Jersey and the University of Pittsburgh, and who has offered courses for the training of teachers and examiners of abnormal children during the last eleven years in the Vineland Training School, the Universities of Pittsburgh, Iowa, California and Montana, and the Harris Teachers College of St. Louis.

Dr. Wallin has been retained as permanent director of the department, which is known as Bureau of Special Education. The present staff includes, in addition to the directors, one assistant to the director, one stenographer on part time, and two critic teachers, a part of whose salaries is paid by the local school districts in which are the observation and practise centers. The main practise center during the present year is in Hamilton. It is hoped to locate the bureau eventually in a large city, which will afford, in connection with the public-school system, ample opportunities for observation and practise teaching in many kinds of special classes and which will also afford superior clinical advantages.

A FOREST EXPERIMENTAL STATION AT ASHEVILLE, NORTH CAROLINA

The continued steady depletion of the timber supply in the Appalachian region has led the Forest Service of the United States Department of Agriculture to establish a new forest experiment station at Asheville, North Carolina. This is the first organization of its kind to be established in the eastern United States.

The staff will be engaged mainly in silvicultural research to secure information greatly needed for the proper management of forest lands in order to insure a continuous supply of timber and other forest products. E. H. Frothingham has been appointed director. He comes to the station with a background of over twelve years of investigative work with the Forest Service throughout the east-

ern United States. The other members of the staff are E. F. McCarthy, for nine years a member of the teaching staff of the New York State College of Forestry at Syracuse University and recently research specialist with the Canadian Conservation Commission; C. F. Korstian, at one time a member of the staff of the Fort Valley Forest Experiment Station and recently in charge of research in the Intermountain District of the U. S. Forest Service, Ogden, Utah; and F. W. Haasis, until recently a member of the investigative staff of the Fort Valley Forest Experiment Station near Flagstaff, Arizona.

THE INSTALLATION OF PRESIDENT FARRAND AT CORNELL UNIVERSITY

DR. LIVINGSTON FARRAND was inaugurated president of Cornell University on October 20. Chief Justice Frank H. Hiscock of the New York State Court of Appeals made an introductory address as chairman of the board of trustees of the university. Acting President Albert W. Smith, formerly dean of Sibley College of Engineering, delivered the seal and charter of the university to President Farrand.

President Farrand then gave his inaugural address, which was on the world situation following the war and the service that the universities should offer.

Following President Farrand's address Dean William A. Hammond spoke for the faculties of the university and Mr. Foster L. Coffin for the alumni.

President A. Lawrence Lowell of Harvard, President M. L. Burton of Michigan, and President R. L. Wilbur of Leland Stanford, Jr., brought the greetings from the universities of the East, Middle West, and West respectively. President Harry W. Chase of the University of North Carolina, who was unable to be present, telegraphed the greetings of the Southern colleges.

Finally Governor Miller presented greetings from the State of New York.

At the dinner in the evening in addition to President Farrand the speakers included President James R. Angell of Yale University, Sir Robert Falconer, president of the University of Toronto, and Dr. Liberty Hyde Bailey.

Coincident with the inauguration of Dr. Farrand came the disclosure that the anonymous benefactor who gave $1,500,000 to Cornell for a new chemical laboratory is Mr. George F. Baker, chairman of the board of directors of the First National Bank of New York. Mr. Baker attended the exercises and laid the corner stone of the laboratory.

Professor E. L. Nichols made an introductory address, which was followed by the main address of the day by Dr. Edgar Fahs Smith, provost emeritus of the University of Pennsylvania and president of the American Chemical Society. Mr. Charles M. Schwab, a trustee of Cornell University, spoke for Mr. Baker.

SCIENTIFIC NOTES AND NEWS

DR. GEORGE S. CRAMPTON was elected president of the Society of Illuminating Engineers at the recent Rochester meeting.

PROFESSOR HENRY S. JACOBY, for thirty-one years a member of the college of civil engineering of Cornell University and for twenty-one years head of the bridge engineering department, will retire from active service at the close of the college year.

ROBERT STANISLAUS GRIFFIN, for more than eight years head of the Bureau of Engineering of the Navy Department and engineer in chief of the U. S. Navy, has retired from active service.

THE Morris Liebman Prize, the cash award made each year by the Institute of Radio Engineers to that member of the institute who is considered to have made the most important contribution to radio art during the preceding twelve months, has been awarded to R. H. Heising, of the engineering laboratory of the Western Electric Company, "for his analysis of vacuum tube action and his research work on modulation systems."

THE first award of the Marcel Benoist Prize of 20,000 francs has been made to M. Maurice Arthus, director of the Institute of Physiology at Geneva. The prize was founded by M. Benoist of Paris, who bequeathed his whole fortune to the Federal Council of Switzerland in recognition of the care and attention which he

received in that country. An award will be made annually to the man of science who, having been domiciled in Switzerland for five years, is judged to have made the most noteworthy contribution to science, particularly in relation to human life, during the preceding year.

Professor Guiseppe Tomassi has been appointed director of the Royal Institute for Agricultural Chemistry in Rome.

Professor Henry Louis has been elected honorary secretary of the Institute of Mining and Mechanical Engineers of the north of England.

The Kindborn Prize of the Swedish Academy of Sciences at Stockholm has been divided equally between Professor Sven Oden for his work on precipitation and C. Lönnquist for his investigation on the temperature of the interior of the earth.

We learn from *Nature* that the Committee of Privy Council for Medical Research has appointed Sir F. W. Andrewes and Sir Cuthbert Wallace to fill the vacancies on the Medical Research Council caused by the retirement of Mr. C. J. Bond and Professor W. Bullock, in accordance with the provisions for rotation made in the Royal Charter under which the council is incorporated.

Mr. D. Prain, agriculturist, Nyasaland, has been appointed to be senior district agricultural officer in Tanganyika Territory; Mr. H. A. Dade to be assistant mycologist in the Department of Agriculture, Gold Coast; and Mr. J. A. Robotham to be assistant agricultural superintendent, St. Kitts-Nevis.

The American School in France for Prehistoric Studies has completed its first term's work in Charente, Dordogne, Corrêze, and the French Pyrénées. Professor George Grant MacCurdy of Yale University, director of the school, has returned to Paris for the winter term.

After two years spent as adviser to the food minister of Poland, E. Dana Durand, professor of economics in the University of Minnesota, has returned to the United States, and has been appointed chief of the eastern European division of the Bureau of Foreign and Domestic Commerce.

Dr. C. Eugene Riggs, president of the Minnesota State Medical Association, gave a Mayo Foundation lecture at Rochester, Minn., on October 4. Dr. Riggs repeated his presidential address, "Minnesota medicine in the making; personal reminiscences," which he gave at the meeting of the Minnesota State Medical Association, in Duluth, on August 24. Dr. Cyrus Northrop, ex-president of the University of Minnesota, delivered a Mayo Foundation lecture on general education on October 11.

Professor Edgar James Swift, head of the department of psychology and education in Washington University, has been invited to give three lectures before the student officers of the Post Graduate School of the U. S. Naval Academy at Annapolis. The first lecture, "The Psychology of Managing Men," was given October 8; the second, "Thinking and Acting," will be given January 28, and the third, "The Psychology of Testimony and Rumor," April 8.

The Harveian Oration before the Royal College of Physicians of London will be delivered by Dr. Herbert Spencer on October 18. The Mitchell lecture by Dr. Parkes Weber, on the relation of tuberculosis to general conditions of the body and diseases other than tuberculosis, will be given on November 1. Dr. Michael Grabham will deliver the Bradshaw lecture, on subtropical esculents, on November 3. The Fitzpatrick lecture, on Hippocrates in relation to the philosophy of his time, will be given by Dr. R. O. Moon, on November 8.

The following public lectures were given during October at University College, London: Beginning October 10 Professor Eliot Smith gave the first of three lectures on The Beginnings of Science; on October 12 Dr. A. Wolf began a series of lectures on the general history and development of science; and October 14 Dr. J. C. Drummond began a course of eight public lectures on nutrition.

The fourth annual Streatfeild memorial lecture was delivered at the Finsbury Techni-

cal College, London, by Mr. W. P. Dreaper, on October 20. The subject was "Chemical Industry a Branch of Science."

THE death is announced of Dr. Albert Sidney Leyton, professor of pathology at the University of Leeds, Great Shelford, Cambridge, aged fifty-two years. His death is said to be directly due to his war service. He was a major and served as bacteriological consultant to the Northern Command, and it was during his investigations of trench fever that he developed the malady from which he died.

THE British Association has marked its appreciation of the plan for establishing the Brent Valley Bird Sanctuary as a permanent nature reserve in memory of Gilbert White by making a contribution through the Selborne Society towards the upkeep and endowment fund.

To mark the recent centenary of James Watt, the Institution of Shipbuilders and Engineers has founded two new chairs in Glasgow University—a James Watt Chair of Electrical Engineering, and a James Watt Chair of the Theory and Practise of Heat.

PROFESSOR EDWARD HJELT, professor of organic chemistry in the University of Helsingfors and at one time Finnish ambassador at Berlin, died on July 2 at the age of sixty-six years.

IT is announced that the annual meeting for 1922 of the British Medical Association will be held at Glasgow on July 21–29.

WE learn from the *Journal of Industrial and Engineering Chemistry* that the appointment of the permanent chief of the Bureau of Chemistry has been delayed because of the impossibility of finding a properly qualified chemist who is willing to take the position at the $5,000 salary attached to it. As a result of this situation, an increase in appropriation to $7,500 will be asked, but under present conditions no congressional action is likely before the middle of next year.

THE Knud Rasmussen expedition left Godthaab, on the southwest coast of Greenland, on September 7. The London *Times* states that the motor schooner *Sea King* during August had been to Thule (northwest Greenland) and brought back the Eskimo members of the expedition, four men and three women, as well as 72 dogs, sledges and furs which excel anything previously known. Part of the clothing sent from Denmark and lost in the shipwreck of the *Bele* has been replaced, and the expedition starts with as good an outfit as possible. In regard to *personnel*, the expedition unfortunately is less lucky. First Peter Freuchen's Eskimo wife Navarana, who was going to follow her husband, died at Upernivik on August 3, and during their southward journey the Cape York Eskimos caught cold which developed into pneumonia. After their arrival at Godthaab they were taken to hospital, where one, the huntsman Iggianguak, who had taken part in some of the previous Thule expeditions, died. The others had so far recovered that the doctor permitted them to rejoin the expedition. The *Sea King* will first go to the coast of Labrador, where M. Lindow, one of the Greenland trade inspectors, will carry on scientific investigations. It will then proceed with Rasmussen's party to Lyon inlet, in the Melville Peninsula. Captain Pedersen will afterwards take the vessel to St. John's, Newfoundland, from which the next report will be sent. The object of the expedition is to explore and map the archipelago between Greenland and the American continent, and also to investigate the migrations of the Eskimo, their folk-lore, and cognate subjects.

UNIVERSITY AND EDUCATIONAL NEWS

BY the will of the late Jonathan M. Parmenter, of Wayland, Mass., a trust fund of over $250,000 is left to Harvard College for the establishment of scholarships.

DR. JOHN LEE COULTER has been elected president of the North Dakota Agricultural College. He takes the place occupied by Dr. E. F. Ladd, who was elected to the United States Senate last March.

Dr. K. G. Matheson, president of the Georgia School of Technology since 1906, has resigned to become president of Drexel Institute. Dr. Matheson will go to Drexel next spring, probably April 1. Until then the institute will continue to be directed by the administrative board, which took charge upon the recent retirement of Dr. Hollis Godfrey.

Dr. Franklin Stewart Harris was installed as president of Brigham Young University at Provo, Utah, on October 17. Dr. Harris, who was formerly director of the Utah Agricultural Experiment Station, succeeds President George H. Brimhall, who becomes president emeritus.

Dr. Frank Pierrepoint Graves, formerly head of the school of education of the University of Pennsylvania, who succeeds Dr. John H. Finley as commissioner of education of New York State, and president of the University of the State of New York, was inducted into office on October 20.

Dr. Harry W. Crane, assistant professor of psychology at Ohio State University, has been called to an associate professorship in psychology at the University of North Carolina. He will also act as psychiatrist to the State Board of Public Welfare.

DISCUSSION AND CORRESPONDENCE

A BIRD'S-EYE VIEW OF AMERICAN LANGUAGES NORTH OF MEXICO

It is clear that the orthodox "Powell" classification of American languages, useful as it has proved itself to be, needs to be superseded by a more inclusive grouping based on an intensive comparative study of morphological features and lexical elements. The recognition of 50 to 60 genetically independent "stocks" north of Mexico alone is tantamount to a historical absurdity. Many serious difficulties lie in the way of the task of reduction, among which may be mentioned the fact that our knowledge of many, indeed of most, American languages is still sadly fragmentary; that frequent allowance must be made for linguistic borrowing and for the convergent development of features that are only descriptively, not historically, comparable; and that our persistently, and rather fruitlessly, "psychological" approach to the study of American languages has tended to dull our sense of underlying drift, of basic linguistic forms, and of lines of historical reconstruction. Any genetic reconstruction that can be offered now is necessarily but an exceedingly rough approximation to the truth at best. It is certain to require the most serious revision as our study progresses. Nevertheless I consider a tentative scheme as possessed of real value. It should act as a stimulus to more profound investigations and as a first attempt to shape the historical problem. On the basis of both morphological and, in part, lexical evidence, the following six great groups, presumably genetic, may be recognized:

I. Eskimo-Aleut

II. Algonkin-Wakashan
- Algonkin-Wiyot-Yurok
- Kootenay
- Wakashan-Salish

III. Na-dene (Haida; Tlingit-Athabaskan)

IV. Penutian
- CalifornianPenutian
- Oregon Penutian
- Tsimshian

V. Hokan-Siouan
- Yuki
- Hokan
- Coahuiltecan group
- Keres
- Tunica group
- Siouan-Yuchi-Muskogian
- Iroquois-Caddoan

VI. Aztec-Tanoan
- Uto-Aztekan
- Tanoan-Kiowa

This leaves the Waiilatpuan-Lutuami-Sahaptin group, Zuñi, and Beothuk as yet unplaced. The lines of cleavage seem greatest between IV. and V., and between III., on the one hand, and I. and II., on the other. Group V is probably the nearest to the generalized "typical American" type that is visualized by linguistic students at large.

E. Sapir

Canadian Geological Survey,
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THE USE OF VITAMINE FOOD-TABLETS AS AN AID TOWARD CONSERVING THE FOOD SUPPLY[1]

IN the conservation of food, it is necessary to remove the vitamines from certain staple products. Wheat flour can not be conserved for a long period unless it is bolted, thereby removing all of the vitamines. Cane sugar is perfectly stable, but this stability is due to the fact that any protein or vitamine that may have been in the cane juice has been removed. The hydrogenated fats are about the most stable of the fats, and yet the vitamine content is zero. It is, therefore, highly desirable to have vitamine preparations to complete the dietary. Fresh vegetables and fruits may be had in season, but their transportation, storage and marketing are very expensive, and usually accompanied by enormous waste. There are many families who do not, under the present system, receive sufficient vitamines in their food. Therefore, some addition seems necessary, but this is clearly considered as an addition, and not as a substitute for anything. These additions may be in the form of dehydrated products. Many of the vegetables and fruits may be dehydrated and consumed in a form which will furnish the consumer with considerable vitamine, and yet not necessitate a change in the methods of preparation of foods by the family. Those dehydrated vegetables may contain vitamines *A* and *B*, and dehydrated fruits may, under certain circumstances, contain in addition some vitamine—*C*. The dietary habits of various persons, however, form an obstacle to the consumption of sufficient vitamines. There are also many persons who can relish fresh foods (spinach, for instance) when they can not stomach dehydrated foods (spinach). The peel of citrus fruits, and some other fruits, is very rich in vitamines, yet no one eats them. For those persons who do not relish certain vitamine-containing vegetable products, the use of tablets containing these products, that may be swallowed whole, seems desirable. Orange peelings ground in a meat chopper, dried and ground in a coffee mill may be made into tablets by the addition of dehydrated orange juice acting as a binder. Such tablets contain vitamines *A*, *B* and *C*. Ground spinach may be similarly made into tablets with orange juice. I have tried these preparations on animals and determined their effectiveness in regard to vitamine content. Many workers may be engaged in determining the exact vitamine content of many of these preparations[2] and I do not wish to compete with their work in this paper, but merely wish to advocate the method of swallowing this vitamine food whole, in order to avoid the censorship of the palate.

J. F. MCCLENDON

[1] Contribution from laboratory of physiological chemistry, University of Minnesota.

SCIENTIFIC BOOKS

The Anatomy of the Nervous System from the Standpoint of Development and Function. By STEPHEN WALTER RANSON, Professor of Anatomy in Northwestern University Medical School. 395 pages, 260 illustrations. Philadelphia, W. B. Saunders Co., 1920.

A certain professor in an American university, through whose laboratory there annually pass between one and two hundred students of the anatomy of the nervous system, has been heard to remark, "Nobody ever learned any neurology out of a book," meaning, of course, that only by actual laboratory contact with neurological materials can one hope to master the baffling complexity of brain structure. No printed description, no pictorial illustration, not even the laboratory demonstration of elegant dissections and brilliantly stained microscopic sections, can take the place of the kinesthetic experience which each must acquire for himself by personal study, manipulation, and dissection of the tissues.

Of course, to this it may be answered that nobody ever learned much neurology without the aid of good books. And until relatively recent times the lack of suitable student manuals was probably one of the factors responsible for the futility of much of the teaching of the

[2] Cooper, Ethel, 1921, *Proc. Exp. Biol. Med.*, XVIII., 343.

structure of the brain, particularly in the medical schools, where the net result of the student's best efforts was too often the acquisition of a jargon of Greek and Latin polysyllables without meaning or interest except to the antiquarian—and the examining board. Other factors in the recent improvement in teaching this subject are students of better caliber and training and better teachers. Without advancement in these two directions the publication of adequate text-books could not greatly improve the situation, for the students of former days could not have used the books of to-day, and the same is probably true of not a few of their teachers.

The study of the brain is intrinsically difficult. The medical student, in particular, must master and remember a vast amount of extremely intricate anatomical detail before he is prepared to diagnose his first neurological case. Since the student can be expected to acquire at best only a very small part of the known details and to remember still less, it is essential that a selection be made for him by his teacher. And the success of the instructor will be determined as much by what he leaves out of the course as by the skill with which he organizes the irreducible minimum which he does attempt to present.

A student who is directed or permitted to memorize a long list of the absurdly cumbersome names which have been given to the visible parts of the brain without gaining a definite idea of their functional significance and interrelationships has a real grievance. And the chief pedagogical difficulty lies in just this point that the parts are so inextricably interrelated, both anatomically and physiologically, that one can not know anything of value about one of them until he knows a little, at least, about a good number of others. It is like learning a new language; the beginner must know something of its grammatical structure and vocabulary before he can read. When I began the study of Latin I was required to spend an entire year in memorizing Harkness' Grammar before I was permitted to read a line of a Latin author. I understand that languages are not taught by that method any more. The teacher of neurology, as of Latin, is faced with the problem of making the structural elements dynamic, of giving them functional values, as early in the course as possible.

The successful text-book on the nervous system, accordingly, must lay down certain general principles of the relations of structure and function, illustrate these by a judicious selection of examples, proceed in an orderly way to an examination of the gross features of the central nervous system, accompanied by an exposition of a few significant microscopic details of each part and an analysis of its functional connections with the periphery and with other centers, and finally these elements must be knit together, the related parts being woven into working systems of conduction pathways and cerebral centers, each of which has a definite part to play in the complex web of bodily adjustments. Not until the anatomical configuration and normal action of each of these several functional systems has been clearly conceived, the topographical relations of the anatomical pathways to each other in various parts of their courses visualized, and the functional patterns in which they may be combined determined, is it possible intelligently to interpret the clinical pictures presented by nervous disorders or to make any diagnosis of a neurological case by other than rule-of-thumb methods.

Dr. Ranson's book very satisfactorily meets these severe requirements. The learner is skilfully guided from the start in his selection of topics and the order in which to take them up by an analysis of the physiological factors in the organization of the nervous system which is simplified as far as the intricacies of the subject permit. The presentation is clear, logical, and accurate. The illustrations are judiciously chosen, many of them are original drawings which are important additions to the literature, and they are beautifully executed. The publishers, too, have done their work admirably, text and figures are well printed, typography clear, and misprints very few. Most of the figures are based on the human nervous system, but there are included excellent drawings of the brains of the dogfish and sheep which

are of especial value for those laboratories in which these types are used to supplement human material.

The unavoidable difficulties of the study of the nervous system are further increased by an unnecessarily cumbersome nomenclature. Ranson has followed in the main the B. N. A. system of terms, wisely using English forms of the names in most cases. This system has at least the merit that it is possible to find out exactly what its names mean. Like nearly all other recent anatomical writers, he departs from this system in some respects (*e.g.*, dorsal and ventral for posterior and anterior. Pending the international revision of the B. N. A., which is perhaps more urgently needed in neurology than elsewhere, it is desirable that certain other changes be widely adopted. The "pons" of the B. N. A. is a hybrid monster, for whose continued existence there is no justification, anatomical, physiological, embryological or comparative. Other similar infelicities might be mentioned.

As indicated at the beginning of this review, the serious study of the nervous system can not proceed far without practical work, and Ranson's book is so organized as to follow the natural sequence of laboratory study. A brief laboratory outline is included in the final 20 pages.

The author has attempted to include within the covers of one book all that the medical student requires for his guidance in a first course on the anatomy of the nervous system, and this task has been well done. That this plan is very acceptable to the student, there can be no question, but in the reviewer's experience this is not an unmixed benefit. With a manual of this sort in his hands it is the very exceptional student who can be induced to consult the atlases and larger works of reference and the periodical literature which he must learn to use if he would win an adequate preparation and the proper outlook for successful work in neurology. The question may be raised whether from the pedagogical standpoint the symmetry and completeness of this work are, after all, really advantageous.

C. JUDSON HERRICK

SPECIAL ARTICLES

A SIMPLE APPARATUS FOR MICRO-MANIPULATION UNDER THE HIGHEST MAGNIFICATIONS OF THE MICROSCOPE

THE microdissection and microinjection of marine ova and of animal and plant cells have hitherto been carried out by means of Barber's[1] pipette holder, an instrument primarily intended for the isolation of bacteria. Barber's instrument had the big advantage over other similar mechanisms in that it enabled one to manipulate needles in a drop hanging from a coverslip suspended over a moist chamber. This eliminated all obstacles between the objective and the coverslip, thereby permitting the use of high-power objectives.

The method of making the glass microneedles and pipettes is described in full in Barber's various papers dating from 1904 to 1914 and in a paper of mine[2] in which the application of the method to microdissection is given.

The principle involved in Barber's apparatus is a carrier pushed along a groove by a screw at one end. By having a series of three carriers built up on one another, each travelling in a different direction, movements in any one of three dimensions may be imparted to a needle clamped on the top carrier. It is difficult to construct this instrument in such a way that each movement can be maintained in a precise focal plane. Even when skilfully made, wear and tear in time renders the movements jerky and undependable.

The instrument described in this paper has the following advantages over Barber's: (*a*) simple construction, (*b*) absence of any lost motion no matter how long the device is used, (*c*) accurate and constant control of the movements of the needle or pipette tip

[1] Barber, M. A., 1904, "A new method of inoculating microorganisms," *Jour. Kans. Med. Soc.*, IV., 487; 1914, "The pipette method in the isolation of single microorganisms and in the inoculation of substances into living cells," *The Philip. Jour. Sc.*, Sec. B, Trop. Med., IX., 307.

[2] Chambers, R., 1918, "The microvivisection method," *Biol. Bull.*, XXXIV., 121.

under the highest magnification of the microscope, (*d*) maintenance of the needle tip in one focal plane while it is being moved back and forth in any of the three directions. The basic principle of the instrument consists of rigid bars which are screwed apart against springs. The movements imparted are in arcs of a circle having a radius of from three to four inches. The arcs produced by the two lateral movements lie in one horizontal plane so that the needle tip does not drop out of focus during these movements. The curvature of the arc is unnoticeable as the extreme range of movements of the fine adjustments is only 3 mm. In the microscopic field no movement over one millimeter is ever required.

A full description of this instrument with photographs and diagrams is being published in the *Anatomical Record* and, possibly, in the *Journal of Bacteriology*. The principle on which the instrument depends is in the process of being patented.

The principle is demonstrated on considering the mechanism for the movements in one plane only (Fig. 1). This consists of three

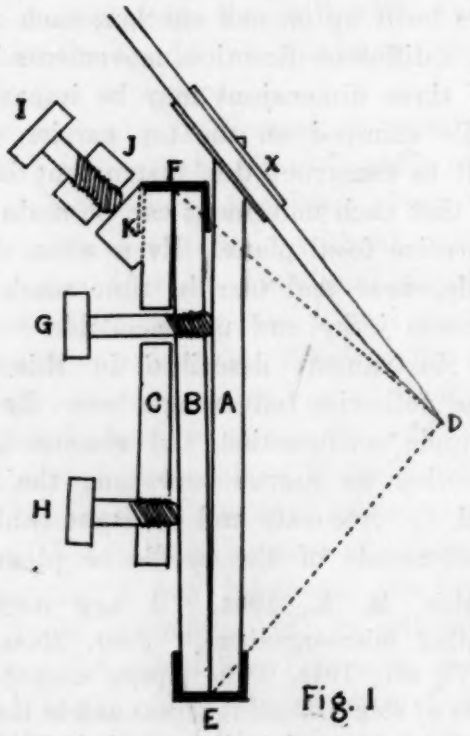

Fig. 1

bars of rigid metal connected at their ends to form a Z-like figure by resilient metal acting as a spring hinge.

By the action of certain screws the bars can be forced apart; on reversing the screws the bars return to their original position owing to the spring action at the ends of the bars. By these means arc movements may be imparted to the tip of a needle when placed in the proper position, and these movements are fine and steady enough to be under perfect control when viewed under the highest powers of the microscope.

The needle or any instrument the tip of which is to be manipulated is held in a carrier fastened to the free end of a bar *A* at *X*. The needle is made to extend so that its tip is at the apex of an imaginary triangle at *D*.

In order to obtain two movements at right angles to one another in the horizontal plane the tip of the needle must be at the apex *D* of a right-angled isosceles triangle, the base of which is a straight line joining the centers *E* and *F* of the springs holding the three bars, *A*, *B* and *C*, together. The shank of screw *G* passes through a large hole in bar *C* and is screw-threaded in bar *B*. Turning screw *G* spreads bars *B* and *A* apart thus imparting an arc movement to the needle tip at *D*. The other screw *H* is screw-threaded in bar *C*. Turning it spreads apart bars *C* and *B* and imparts an arc movement to the needle tip at *D* at right angles to that procured by turning screw *G*.

The movement in the vertical plane at right angles to the afore-mentioned movements is procured by screw *I* (Fig. 2), which

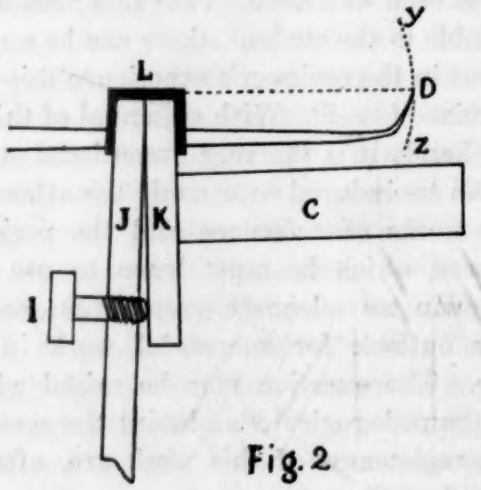

Fig. 2

is screw-threaded in a rigid vertical bar *J*

and abuts against a vertical extension *K* of the bar *C*. The extension *K* is parallel to the bar *J* and is connected to it at its top by means of a solid spring hinge. Turning screw *I* spreads apart bars *J* and *K* and lifts the whole combination (*A*, *B* and *C*) and imparts an arc movement in the vertical plane to the tip of the needle at *D*. To procure a vertical movement the tip of the needle at *D* must lie in the same horizontal plane *L–D* with the spring fastening *K* and *J* together. When screw *I* is turned the needle tip will then move in an arc *Y* to *Z* more nearly vertical than any other arc on the same circumference of which the point *D* is the center.

The rigid bar *J* can be attached directly to the stage of the microscope, or it may consist of a pillar rising from a metal base. In the latter case the microscope is clamped to the base alongside the pillar. In both cases the needle carrier *X* (Figs. 1 and 2) is arranged to allow the needle to project over the microscope stage with its tip in the field of the microscope objective.

This instrument can be used singly for one needle or with a companion when two needles or a needle and a pipette are to be used simultaneously. When a pair is to be used, one is a left-handed and the other a right-handed instrument.

There are two models of the micro-manipulator, a simple and a more elaborate form. Both are identical in the accuracy and extent of the fine movements. The advantages of the elaborate over the simple form are (1) great steadiness, (2) independence of the microscope from the apparatus and (3) special features for the preliminary adjustments of the needle or pipette.

In the elaborate form the manipulator is fastened on a pillar independent of the microscope. The pillar is screwed into a heavy base to which the microscope is clamped. This ensures great steadiness. The microscope can be removed at any time, thus facilitating greatly the exchange of needles and the preparation of the apparatus for micro-injection. Also the coarse adjustments are controlled by screws which aids greatly in the preliminary adjustments of the needle or pipette when bringing it into the focal field of the microscope.

The simple form is more compact and can be clamped directly to the stage of the microscope. Its steadiness, therefore, depends upon the steadiness of the microscope stand. The preliminary coarse adjustments of the needle depend upon sliding movements which are operated by hand. They are, therefore, less readily performed than in the case of the elaborate form. However, the essential feature of the instrument is in the fine adjustments and these are identical in their accuracy in both forms.

A very convenient combination is a left-handed needle manipulator of the elaborate type including the base and a right-handed manipulator of the simple type. On the other hand, the simple form either singly or with both a right- and a left-handed manipulator, is very serviceable.

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CHROMOSOME RELATIONSHIPS IN WHEAT

IN 1917 the writer found the chromosome number of *Triticum durum* to be 28 in the fertilized egg cell. Since the number of chromosomes in wheat had been previously reported as 8 by a number of other investigators a systematic study of the chromosome number of the species of wheat was undertaken, together with a study of sterility in interspecific crosses already in progress. This work has been interrupted and in the meantime Sakamura[1] and Kihara[2] have published short accounts of the chromosome numbers in wheat. Their work seems to have received little attention, possibly due to the lack of convincing illustrations.

The writer has found the same chromosome numbers as reported by Sakamura. Einkorn has 7 haploid chromosomes; the Emmer group, consisting of *T. dicoccum*, *T. durum*, *T. turgidum* and *T. polonicum*, has 14 haploid chro-

[1] *Bot. Mag. Tokyo*, Vol. 32, 1918.

[2] *Bot. Mag. Tokyo*, Vol. 33, 1919, and Vol. 35, 1921.

mosomes, and the Vulgare group, consisting of *T. vulgare* and *T. compactum*, has 21 haploid chromosomes.

A study of the sterility relationships of species crosses has already been completed and is of considerable interest in connection with the chromosome number. Einkorn with 7 chromosomes crossed with members of the Emmer group with 14 chromosomes or with members of the Vulgare group with 21 chromosomes, results in almost totally sterile F_1 plants. Members of the Emmer group crossed with members of the Vulgare group result in only partially sterile F_1 individuals. Species within each group are inter-fertile.

A review of the wheat crosses made reveals the fact that practically the only hybrids of economic importance are crosses within the Vulgare group. The Emmer group possesses many valuable characters such as drouth and rust resistance, and certain varieties are heavy yielders under some conditions. Many crosses have been made between the members of the Emmer and Vulgare groups, but very few, if any, of the segregates have combined the desirable characters of both parents. It is possible that all F_1 gametes containing approximately half Vulgare chromosomes and half Emmer chromosomes are sterile and only gametes containing nearly all Vulgare or nearly all Emmer chromosomes survive. East[3] has suggested that such behavior may occur in certain Nicotiana hybrids which are partially sterile. Work now in progress makes this conclusion rather doubtful for wheat hybrids. An analysis of six characters involving 80 F_2 individuals of a cross of *T. durum* $\times$ *T. vulgare* does not indicate that there is greater sterility in the intermediates than in seregates resembling the parents.

There is a rather striking correlation between chromosome number and adaptability among the species of wheat. Einkorn with only 7 haploid chromosomes is of practically no economic value. In the United States it is grown only for experimental purposes. In the Emmer group with 14 haploid chromosomes, *T. durum* is the only species grown commercially in this country. The durum wheats are for the most part limited to the plains of the Dakotas and Montana. The Vulgare group with 21 chromosomes is in general the most adaptable of the three groups of wheat. It is grown in practically all parts of the United States from Maine to California, in humid sections of the central states, and on the semiarid plains of the western states. There is certainly a high degree of correlation between chromosome number and adaptability of the species of wheat, but it would be difficult to prove that adaptability is due primarily to differences in chromosome number.

The fact that the chromosomes are in multiples of 7 suggests that the species having 14 and 21 chromosomes are the result of reduplication of the 7 chromosomes of Einkorn or wild wheat. There is some evidence that the larger chromosome numbers are due to reduplication rather than fragmentation. If we assume that the size of a given cell is dependent on the chromosome content, the relationship of the three groups of wheat species becomes clearer. We have found that the volume of the mature pollen grains, measured in thousands of cubic microns, is about 72 for Einkorn, 94 for the Emmer group, and 114 for the Vulgare group. The differences in chromosome numbers of the three groups of species are closely associated with corresponding differences in size of pollen grains.

In the reduction divisions of the F_1 hybrids of crosses between members of the Emmer and Vulgare groups we find additional evidence that the larger chromosome numbers are the result of reduplication rather than fragmentation. When the chromosomes pair for the reduction division we find only 14 pairs of chromosomes and 7 single chromosomes on the heterotypic plate. The members of the paired chromosomes separate and pass to the poles leaving the 7 single chromosomes on the equatorial plate. These single chromosomes ultimately divide and pass to the poles. If the 21 chromosomes of the Vulgare group are the result of fragmentation we should expect that homologous segments

[3] *Proc. Amer. Phil. Soc.*, Vol. 54, 1915.

segments of the 14 chromosome group and that no single unpaired chromosome would be present in the reduction divisions.

If the 14 and 21 chromosome species are the result of reduplication we might expect a considerable number of characters in the Emmer and Vulgare groups to be dependent on multiple factors. Although many characters of these groups are apparently dependent on single factors there are a number of characters dependent on two or more factors. The red color of grain may be determined by one, two or three factors, and pubescence of chaff and color of chaff have also been found to be dependent on several factors in some cases. A comparatively large number of multiple factors affecting the same qualitative characters are reported in wheat.

If the Vulgare group, the Emmer group, and Einkorn differ only in chromosome combination of 7×3, 7×2, and 7×1, why should the different groups result in sterile or partially sterile F_1 plants and why should the different groups vary so greatly in morphological characters? Morgan has suggested that for similar cases in other plants that changes may occur in the individual chromosomes in the course of time so that the original chromosomes would come to differ in many factors. If the 14 and 21 chromosome species have originated by reduplication of the 7 chromosome group such changes must have occurred. The species within each group overlap considerably, but each group is relatively distinct in morphological characters.

KARL SAX
MAINE AGRICULTURAL EXPERIMENT STATION,
May 6, 1921.

ASTRONOMICAL MEETING AT THE POTSDAM ASTRONOMICAL OBSERVATORY

THE following is an abstract of a German press report of the international astronomical meeting held at Potsdam, August 24–27 last.

After a lapse of eight years the Astronomical Society met again at Potsdam, under the presidency of Professor Strömgren of Copenhagen. Representatives from sixteen nations were present. About two hundred attended the meeting; from Scandinavia, Professor Bohlin, Stockholm; Professor v. Zeipel and Amanuens Asklöff, Upsala; Professor Strömgren and assistant Miss Vinter-Hansen, Copenhagen; from Christiania, observer Lous, and from Finland Furuhjelm; from Holland Professor Kapteyn as well as Van Rhejn and Father Esch; from England Professor Eddington, also Father Cortie, S.J.; among others were Professors Bauschinger, Hartwig, Einstein, Grossman, Nernst, Runge, Schorr, Wiechert, Prey, and Kienle.

Professor Strömgren in his address referred to the continuance of the communication of astronomic phenomena during the years of stress through the instrumentality of the Copenhagen observatory, instead of from Kiel. Copenhagen served also as a medium for the exchange of astronomic and scientific literature.

The scientific program contained many papers showing the progress which astronomy has made of recent years into details of which we can not here enter. However, from Father Hagen we learn of the immense masses of dark nebulæ; from Kühl (Munich) explanation was given of many hitherto unexplained astronomical phenomena shown in the telescope as well as on the photographic plate; from Zeipel we learn of the determination of the masses of the stars in the globular clusters and that they obey the same laws as the molecules in a so-called ideal gas.

Rosenberg reported on the improvement of the photo-electric method for the determination of brightness of stars. The accuracy of measurements approaches the 10,000th of a magnitude. v. Tamm (Sweden) surprised the meeting with an ingenious and simple method for the determination of the color of stars photographically with a single exposure. Professor Oppenheim (Vienna) presented an interesting theory on the movement of the stars. Dr. Moll of Utrecht spoke of a new microphotometer for the measurement by means of a thermopile of the distribution of brightness in stellar spectra.

A committee was appointed in connection with an expedition for observing the solar eclipse next year in the Dutch East Indies. It is intended to repeat the experiment of Professor Eddington in connection with the theory of relativity.

A visit was paid to the observatories in Potsdam and Neubabelsberg. They were shown also the Einstein tower, a new structure to further test the effect of relativity, the details of which were explained by Professor Freundlich. Professor Guthnick has been appointed director in succession to

would pair with entire chromosomes or larger

the lamented late Professor Struve. The observatory at Potsdam was shown by Professor Ludendorff, who recently has been appointed director of the Astrophysical Observatory.

A visit was paid also to the Geodetic Institute. At the wireless station the guests had the opportunity of listening to the wireless time signals from Annapolis.

One afternoon was devoted to an excursion on the Havel to the Wannsee and Nikolskee. At a tea in the library an opportunity was afforded for viewing Professor Darmstädter's collection of letters of celebrated naturalists and autographs of noted astronomers.

A feature of the meeting was the gathering in the large dome of the Potsdam Observatory, where refreshments were served and a social evening spent, the success of which was in a large measure due to the ladies of the observatory staff and others.

The four-days sessions are said to have passed without a jarring note and all parted with satisfaction at the scientific results that had been brought forth at the meeting and at the pleasure of having again renewed old friendships together with gratitude for the hospitality extended to them at Potsdam. The next meeting is to be held at Copenhagen.

AMERICAN MATHEMATICAL SOCIETY

The twenty-eighth summer meeting of the American Mathematical Society was held at Wellesley College, September 7–9, 1921, in conjunction with the meeting of the Mathematical Association of America. The attendance included ninety-one members of the Society. Eleven new members were elected, and thirty applications for membership were received.

Two joint sessions were held with the Mathematical Association of America, at which papers were read by Professor James Pierpont, on *Some mathematical aspects of the theory of relativity;* and by Professor A. C. Lunn, on *The place of the Einstein theory in theoretical physics.* The following papers were read at the regular sessions of the Society:

Einstein static fields which admit a continuous group G_3 of transformations into themselves: L. P. Eisenhart.

On the class of a certain type of Einstein spreads: John Eiesland.

The solar gravitational field and certain other fields completely determined by light rays: Edward Kasner.

Prime-power groups containing only one invariant subgroup of every index which exceeds this prime number: G. A. Miller.

General mean value relations: G. D. Birkhoff.

On plates of variable thickness: G. D. Birkhoff.

Application of least squares to the problem of apportionment: E. V. Huntington.

The summation by series by means of generating functions: I. J. Schwatt.

The expansion of any power of a multinomial: I. J. Schwatt.

The operator $(r(d/dr))$ on $F(r)$: I. J. Schwatt.

Geometric characterization of special singly infinite families of heat curves: Eugenie C. Hausle.

On the stability of a bicycle with a light frame: J. L. Synge.

Note on the definition of a linear functional: C. A. Fischer.

Certain theorems concerning simple closed and open curves: J. R. Kline.

A theorem concerning connected sets which become totally disconnected upon the removal of a single point: J. R. Kline.

Concerning connectedness im kleinen and a related problem: R. L. Moore.

The probability function for the sum of certain functions, with applications to the theory of errors: E. L. Dodd.

On power series with positive real part in the unit circle: T. H. Gronwall.

Some theorems on transformations with invariant points: J. W. Alexander.

Theorem on the interior of a simply connected closed surface in three-space: J. W. Alexander.

A fundamental class of geodesics on closed surfaces of genus greater than unity: H. M. Morse.

On the problem of steering an automobile around a corner: A. G. Webster.

On the principles of mechanical integrators for differential equations, especially those of exterior ballistics: A. G. Webster.

On the Fourier's series of non-integrable functions: C. N. Moore.

A generalization of Laguerre's rule of signs: C. F. Gummer.

The functions analogous to Lebesgue constants for a series of Hermite polynomials: R. E. Gilman.

Theory of invariant elements: O. E. Glenn.

On the location of the roots of the jacobian of two binary forms: J. L. Walsh.

The power of a modern gun and of thunder: J. E. Rowe.

Spurious correlation applied to urn schemata: J. R. Musselman.

The significance of the partial correlation coefficient in the comparison of ordered statistical series possessing rectilinear trends: W. L. Crum.

A tentative substitute for the standard deviation in the examination of the dispersion of an ordered statistical series: W. L. Crum.

The value of a sample. Second paper: B. H. Camp.

A form of series for potential problems: Norbert Wiener.

Some hydrodynamic aspects of group theory: S. D. Zeldin.

Two-way series for Lebesgue integrals: M. B. Porter.

R. G. D. Richardson,
Secretary